

DESCRIPTION OF THE IMMATURE STAGES OF THREE SPECIES OF  
*EULEPIDOTIS* GUENÉE (LEPIDOPTERA: NOCTUIDAE) WITH  
NOTES ON THEIR NATURAL HISTORY

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*Abstract.*—Larvae and pupae of the genus *Eulepidotis* Hübner are described for the first time. The species are *E. merricki* (Holland), *E. juncida* (Guenée), and *E. superior* (Guenée), all of Neotropical distribution. The larval host of *E. merricki* is Spanish-lime, *Melicoccus bijugatus* Jacq. (Sapindaceae), which is cultivated as an ornamental and fruit tree throughout the Caribbean. Larvae of *E. juncida* were reared from *Inga fagifolia* (L.) Willd. ex Benth. (= *Inga laurina* (Sw.) Willd.) (Mimosaceae). Larvae of *E. superior* were defoliating *Quararibea asterolepis* Pitt. (Bombacaceae).

*Key Words:* *Melicoccus*, Sapindaceae, *Inga*, Mimosaceae, *Quararibea*, Bombacaceae, host plants, Neotropical, Panama, Puerto Rico

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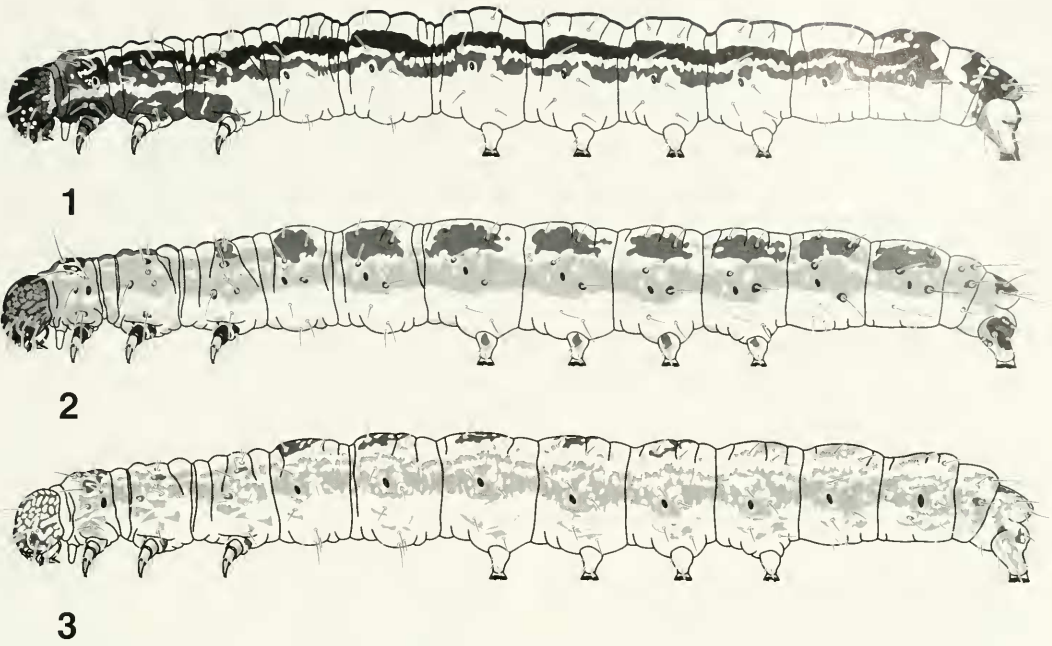
Larvae of tropical Lepidoptera are poorly known, and unless reared to adults, they are virtually impossible to identify specifically. We describe for the first time the immature stages of *Eulepidotis* Hübner, a large genus belonging to the subfamily Catocalinae, that is mainly of Neotropical affinity and which comprises 105 species, 3 of which occur in North America (Poole 1989, Poole and Gentili 1996). The immature stages of *E. merricki* (Holland), *E. juncida* (Guenée), and *E. superior* (Guenée) were studied.

There have been two reports of *Eulepidotis* larvae defoliating tropical trees. Wong et al. (1990) reported larvae of *E. superior* defoliating *Quararibea asterolepis* Pitt. (Bombacaceae) on Barro Colorado Island, Panama. Nascimento and Proctor (1994) reported that larvae of *E. phrygionia* Hampson were defoliating a monodominant rainforest of *Peltogyne gracilipes* Ducke (Cae-

salpiniaceae) on Maracá Island, Roraima, Brazil. Unfortunately no larvae from the latter study were preserved.

Larvae, pupae, and adults of *E. merricki* were sent to one of us (MGP) by Lionel-Pagan, U.S.D.A., Animal and Plant Health Inspection Service, Plant Protection and Quarantine, San Juan, Puerto Rico, for identification. The larvae were defoliating Spanish-lime, *Melicoccus bijugatus* Jacq. (Sapindaceae), a tree used for fruit and as ornamental purposes in the Caribbean. Spanish-lime is native to continental tropical America from Nicaragua to Surinam and is planted widely and becoming naturalized in the Caribbean (Adams 1972, Proctor 1984).

One of us (AA) reared the immature stages of *E. juncida* and *E. superior*. The host of *E. juncida* was *Inga fagifolia* (L.) Willd. ex Benth. (= *Ingalaurina* (Sw.)



Figs. 1–3. Larval habitus. 1, *Eulepidotis merricki*. 2, *E. juncida*. 3, *E. superior*.

Willd.) (Mimosaceae). The host of *Eulepidotis superior* is *Quararibea asterolepis* Pitt (Bombacaceae).

METHODS AND MATERIALS

Twenty-two larvae of *E. juncida* were collected and designated as Aiello Lot 80-003. Fifteen of the larvae were preserved in 80% ethanol. Seven were placed in a cylindrical rearing cage along with both old and young foliage. The cage was constructed from petri dishes and aluminum window screen with a circle of paper towel on the floor and measured 10 cm tall by 9 cm in diameter. To maintain and regulate humidity, a damp, folded strip of paper towel was placed on the cage cover, and the entire assembly was kept inside a clear plastic ZipLoc® bag. After pupation the pupae were placed into separately numbered cages to await eclosion. Fifteen larvae, one pupa, and four adults with associated pupal skins are in the collection of the National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Three larvae and 10 pupae of *E. superior* were obtained and designated as Aiello Lot 85-19. The larvae were preserved in 80% ethanol, and seven adults with associated pupal skins were reared and are in the collection of the Smithsonian Tropical Research Institute, Republic of Panama.

KEY TO KNOWN *EULEPIDOTIS* LARVAE

- 1. Head dark brown to black, reticulate pattern reduced; mid-dorsal stripe black, solid (Fig. 1); setae A1—A2—A3 form an acute angle (Fig. 5) . . . . . *E. merricki* (Holland)
- Head brown, reticulate pattern covers most of head; mid-dorsal stripe broken (Figs. 2–3); setae A1—A2—A3 form an obtuse angle (Figs. 12–19) . . . . . 2
- 2. Head with reticulate pattern restricted to lateral area; dorsolateral markings on abdomen in pairs (Fig. 2); labrum with one pair of setae on lateral margin (Fig. 14) . . . . *E. juncida* (Guenée)
- Head uniformly covered with a reticulate pattern; abdominal segments with single large dorsal markings (Fig. 3); labrum with two pairs of setae on lateral margin (Fig. 21) . . . . . *E. superior* (Guenée)

KEY TO KNOWN *EULEPIDOTIS* PUPAE

- 1. Length less than 12 mm; labial palpus disjunct (Fig. 30) . . . . . *E. juncida* (Guenée)
- Length greater than 13 mm; labial palpus continuous (Figs. 25 and 34) . . . . . 2
- 2. Profemur absent (Fig. 25) . . . . .  
 . . . . . *E. merricki* (Holland)
- Profemur present (Fig. 34) . . . . .  
 . . . . . *E. superior* (Guenée)

*Eulepidotis merricki* (Holland)  
 (Figs. 1, 4–10, 25–29)

Larva

Diagnosis.—Dorsal black stripe from pronotum to transverse stripe on segment 8 and extending beyond band to segment 9. Head black to dark brown, without reticulate pattern.

Description.—*Head* (Figs. 5–10): Width of head capsule 1.8 ± .06 mm (range, 1.8–1.9 mm) (n = 5). Black to dark brown; ecdysial line, epicranial suture, and posterior margin of head to stemmatal area cream. Prothoracic shield dark brown; medial patch dark brown within cream stripe; dorsolateral band cream; lateral edges dark brown. Labrum medially cleft; 3 pairs of dorsal setae forming an oblique line medially (Fig. 7); 3 pairs of ventral epipharyngeal setae (Fig. 8). Mandible with 3 distinct broad teeth; oral surface with broad molar-bearing process (Fig. 10).

*Thorax*: Dorsal stripe black; dorsolateral band cream; lateral band broad, black, divided by a series of cream spots, extending to just below setae L1 and L3. Legs dark brown. Underside dark brown to mesothoracic legs, caudal half of mesothorax cream; V1 setae surrounded by dark brown spot.

*Abdomen* (Fig. 1): Dorsal stripe black to broad transverse band on segment 8 and extends between segments 8 and 9; dorsolateral band cream; lateral stripe black; lower lateral stripe with irregular margins, cream; spiracular stripe black with irregular margins and not enclosing spiracle; below spiracles and venter cream. Prolegs cream; plantae black; crochets in an uniordeinal mesoseries. Segments 1 and 2 with 3 SV setae.

Pupa

Diagnosis.—Labial palpi present, continuous; profemur absent.

Description.—*Male* (Figs. 25–27): Length 15.8 ± 1.04 mm (range, 15.0–17.0 mm) (n = 3). Labial palpi present, continuous. Profemur absent. Mesothoracic leg-reaching eye. Wings do not extend beyond caudal margin of segment 4. Segments 1–3 and 8 with shallow circular pits on dorsum; segments 4–7 with shallow circular pits in a dense band extending about ¼ width of segment caudally and completely encircling segments 5–7; segment 9 smooth. Genital opening on a circular plate. Anal opening below genital opening. Cremaster consisting of a large median pair of slightly curved hooks and 3 pairs of small hooks, 1 pair located mediodorsally, 2 pairs located laterally (Fig. 27).

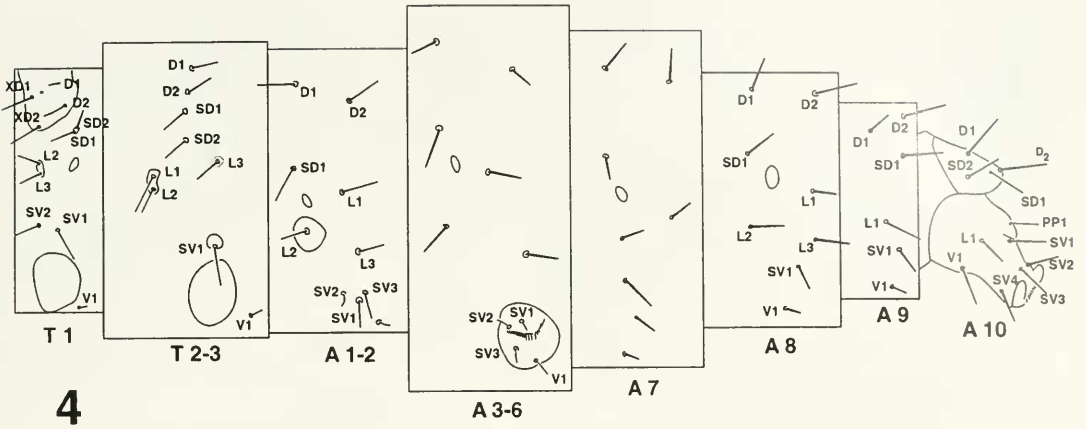
*Female* (Figs. 28–29): Similar to male except: length 15.2 ± 0.35 mm (range, 15.0–15.5 mm) (n = 2). Genital opening at caudal border of segment 8, dividing segment 8 ventrally. Anal opening well caudad of genital opening.

Host.—*Melicoccus bijugatus* Jacq.; Family Sapindaceae; common names: Spanish-lime, genip, honeyberry, mamoncillo, quenette, Quenepa, Hongibeere.

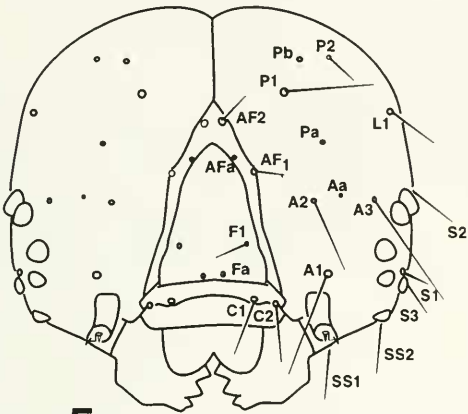
Natural history.—The only information known is that thousands of larvae were defoliating the host plant (Lionel Pagan, personal communication).

Discussion.—The adult of *E. merricki* most closely resembles *Eulepidotis carcistola* Hampson and *E. fumata* (Felder and Rogenhofer). In *E. merricki* the prothorax and tegula have a black stripe; this is absent in *E. carcistola* and *E. fumata*. An elongate white spot at the base of median line of the forewing is larger and more distinct in *E. carcistola* than in *E. merricki* and *E. fumata*. The forewing lines in *E. fumata* are very faint compared with the bold distinct lines in *E. merricki*.

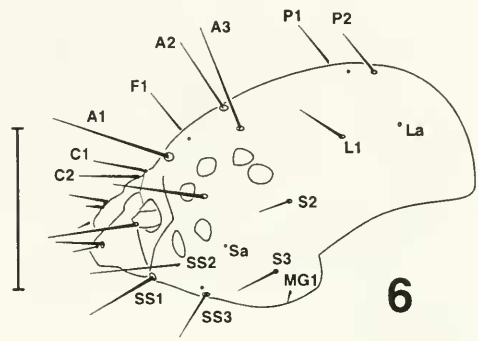
*Eulepidotis merricki* was described from a specimen collected flying around low



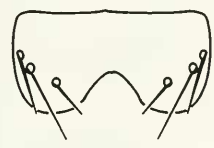
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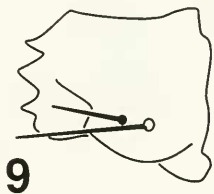
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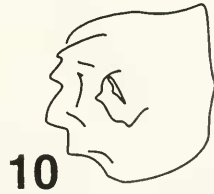
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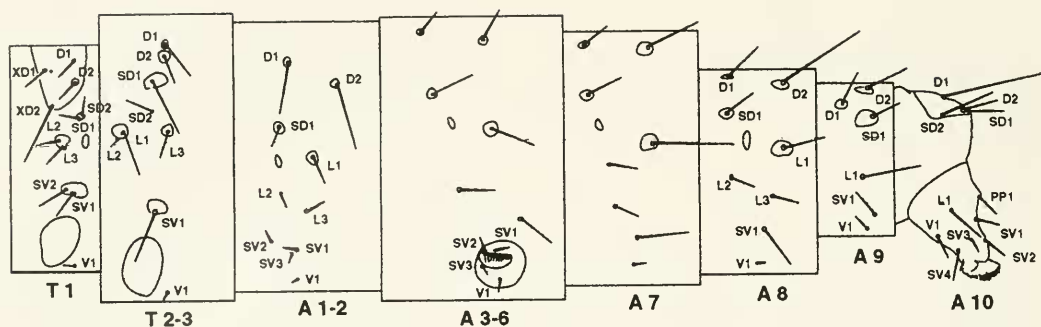


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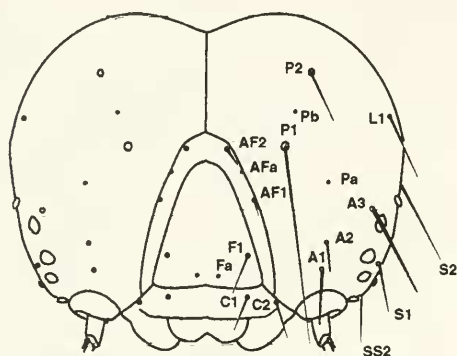


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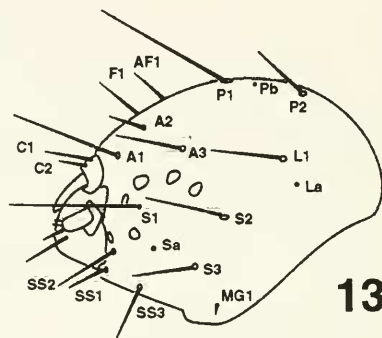
Figs. 4-10. *Eulepidotis merricki* larva. 4, Setal map. 5, Head. 6, Head, lateral view (scale = 0.5 mm). 7, Labrum, dorsal view. 8, Labrum, ventral view. 9, Mandible, dorsal view. 10, Mandible, ventral view (scale = 0.1 mm).



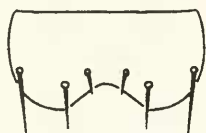
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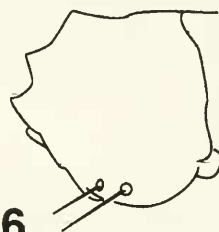
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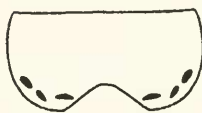
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Figs. 11-17. *Eulepidotis juncida* larva. 11, Setal map. 12, Head. 13, Head, lateral view (scale = 0.5 mm). 14, Labrum, dorsal view. 15, Labrum, ventral view. 16, Mandible, dorsal view. 17, Mandible, ventral view (scale = 0.1 mm).

herbage outside New Brighton, Pennsylvania, on August 5, 1900. Holland (1902) in the original description stated that it is very close to *Palindia mabis* Guenée (= *E. juncida* (Guenée)) which he confused as a syn-

onym of *Palindia fumata* Felder and Roggenhofer (= *E. fumata*). The point is that *E. merricki* is not a Nearctic species but a Neotropical one, and that H. D. Merrick just happened to collect a specimen that

was somehow imported from the Neotropics, possibly on tropical fruits. There are no other specimens of *E. merricki* from the Nearctic in the National Museum, Washington, D.C., or The Natural History Museum, London, collections. In Franclemont and Todd (1983) *E. merricki* is noted as being of questionable occurrence in America north of Mexico.

*Eulepidotis merricki* has a Caribbean distribution, having been collected from Jamaica, Cuba, and Puerto Rico.

*Eulepidotis juncida* (Guenée)

(Figs. 2, 11–17, 30–33)

Larva

Diagnosis.—Head brown with reticulate pattern restricted to lateral area. Dorsum of abdomen with pair of dorsolateral brown patches encompassing setae D1 and D2.

Description.—*Head* (Figs. 12–17): Width of head capsule for three instars as follows: 1.2 mm ( $n = 1$ );  $1.8 \pm .03$  mm (range, 1.7–1.8 mm) ( $n = 7$ );  $2.0 \pm .05$  mm (range, 2.0–2.1 mm) ( $n = 7$ ). Brown with lateral reticulate pattern; adfrontal area from ecdysial line to just beyond setae AF1 cream; setae P1 and P2 with cream pinacula. Labrum medially cleft; 3 pairs of dorsal setae with second pair below other pairs; 3 pairs of ventral epipharyngeal setae (Fig. 15). Mandible with 2 distinct broad teeth, 1 smaller tooth mostly obscured from dorsal view; oral surface with a broad molar-bearing process with small pointed processes on either side (Fig. 17).

*Thorax*: Prothoracic shield brown; dorsolateral band cream; small cream patch between D2 and XD2. Dorsal stripe or patch on segment 2 brown, on segment 3 cream; dorsolateral band cream; lateral band broad, brown, interrupted by several cream spots, extending to just below setae L1 and L3. Legs brown. Underside mostly cream, brown shading between coxae and encompassing V1 setae.

*Abdomen* (Fig. 2): Dorsum with pair of dorsolateral brown patches encompassing setae D1 and D2; lower lateral stripe cream,

consisting of irregular spots and stripes that are more or less contiguous to segment 6, line not contiguous to absent on segments 7 to 9; spiracular band brown, broad, extending below L1 seta; below L1 seta and venter cream. Prolegs cream to brown laterally; plantae cream; crochets in an unioordinal mesoseries. Segments 1 and 2 with 3 SV setae.

Pupa

Diagnosis.—Small, less than 12 mm long. Labial palpi present, but disjunct. Profemur present.

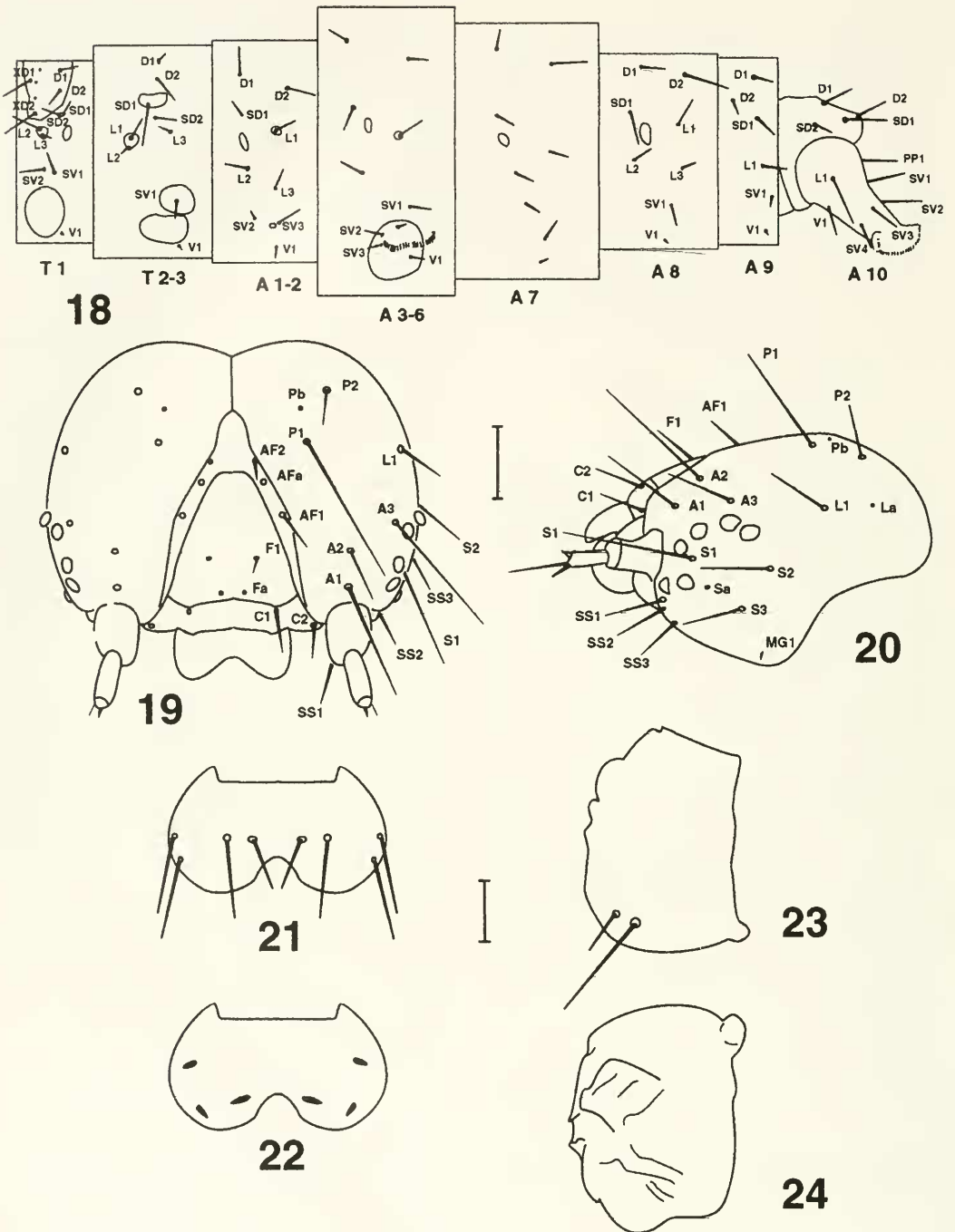
Description.—*Male* (Figs. 30–33): Length  $9.3 \pm 0.40$  (range, 8.9–9.7 mm) ( $n = 3$ ). Labial palpi present, disjunct. Profemur present. Mesothoracic leg reaching eye. Wings do not extend beyond caudal margin of segment 4. Segments 1–3 and 8 dorsum with shallow circular pits; segments 4–7 with shallow circular pits in a dense band extending about  $\frac{1}{4}$  width of segment caudally and completely encircling segments 5–7; segment 9 smooth. Genital opening on a circular plate. Anal opening caudad of genital opening. Cremaster consisting of a large median pair of curved hooks and 3 pairs of small hooks, 1 pair located mediodorsally, 2 pairs located laterally (Figs. 32–33).

*Female* (Fig. 33): Similar to male except: length  $9.4 \pm 0.99$  mm (range, 15.0–17.0 mm) ( $n = 2$ ). Genital opening at caudal border of segment 8, dividing segment 8 ventrally. Anal opening well caudad of genital opening.

Host.—*Inga fagifolia* (L.) Willd. ex Benth. (= *Inga laurina* (Sw.) Willd.); family Mimosaceae.

Natural history.—On March 5, 1980, an outbreak of larvae occurred on Barro Colorado Island, Republic of Panama, near the 900 meter mark on Thomas Barbour Trail on the central plateau of the island. Larvae were so abundant that the rainlike sound of their fecula landing on the leaf litter could be heard many meters away.

Although the majority were in the cano-



Figs. 18-24. *Eulepidotis superior* larva. 18, Setal map. 19, Head. 20, Head, lateral view (scale = 0.5 mm). 21, Labrum, dorsal view. 22, Labrum, ventral view. 23, Mandible, dorsal view. 24, Mandible, ventral view (scale = 0.1 mm).

py, larvae fed at various levels in the tree eating only young leaves. They dropped on silk lines to the forest floor and surrounding vegetation to molt. Molting took place under a sheet of silk across a leaf. Larvae walked by "looping," as do geometrids, but they have the full complement of five pairs of prolegs.

Some larvae dropped, presumably in response to some perceived danger, and began reascending almost immediately. They progressed slowly by gathering the silk line into a ball using their thoracic legs. Upon completion of their journey, they abandoned the ball of silk.

Seven larvae were brought into the laboratory on March 5; one died on March 7. The remaining six molted on March 9, and late on March 10 began preparing pupation chambers of fecula and intact leaves on the cage floor. Five pupated on March 11, and the sixth larva failed to pupate and died on March 12. Two adults eclosed during the night of March 19–20, and two more eclosed during the night of March 20–21. The fifth pupa died and was preserved. Pupal duration was 9 days for females and 10 days for males.

**Discussion.**—In the adult stage, *E. juncida* is similar to *E. juliata* (Stoll). In *E. juncida* the median brownish-yellow stripe extends from the costa to the inner margin of forewing, in contrast to *E. juncida*, which has a more whitish-yellow median stripe that does not extend to the inner margin.

*Eulepidotis juncida* has a wide distribution from Mexico to Panama in Central America and from Guyana, Venezuela, and Colombia to Bolivia in South America. *Eulepidotis juliata* is known, so far, only from Guyana, Venezuela, and Bolivia.

*Eulepidotis superior* (Guenée)

(Figs. 3, 18–24, 34–37)

Larva

**Diagnosis.**—Reticulated pattern covering entire head. A single large mid-dorsal light brown (in alcohol specimens) mark on all abdominal segments.

**Description.**—*Head* (Figs. 19–24): Width of head capsule for two instars as follows: 1.9 mm (n = 1); 2.6 mm (n = 2). Brown with cream reticulated pattern. Labrum cream, medially cleft; 3 pairs of dorsal setae forming a straight line medially; 2 pairs of small setae along lateral edge; 3 pairs of ventral epipharyngeal setae (Fig. 22). Mandible with 2 outer setae; cutting surface with 3 indistinct teeth; oral surface with broad molar-bearing process (Fig. 24).

*Thorax:* Prothoracic shield brown; mid-dorsal stripe faint, cream; lateral stripe wide, cream; marked with various spots and patches of cream. Cream dorsally with a few faint mid-dorsal patches of brown. Prothorax with SD and L setal groups on brown pinacula. Thoracic segments 2 and 3 with seta SD1 and setae L1 and L3 on brown pinacula. Legs cream. Underside cream.

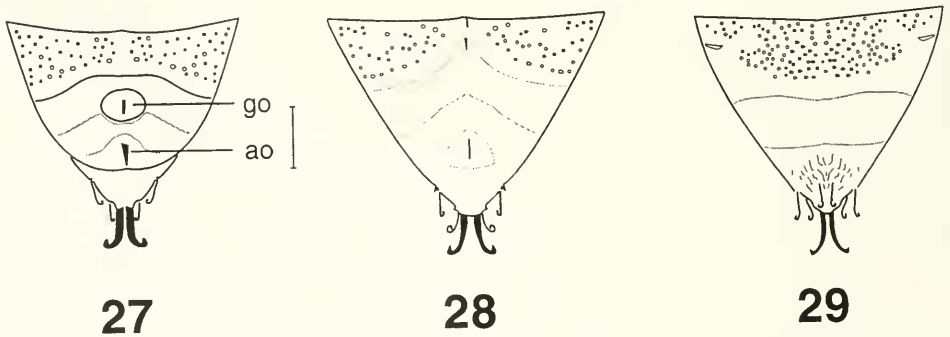
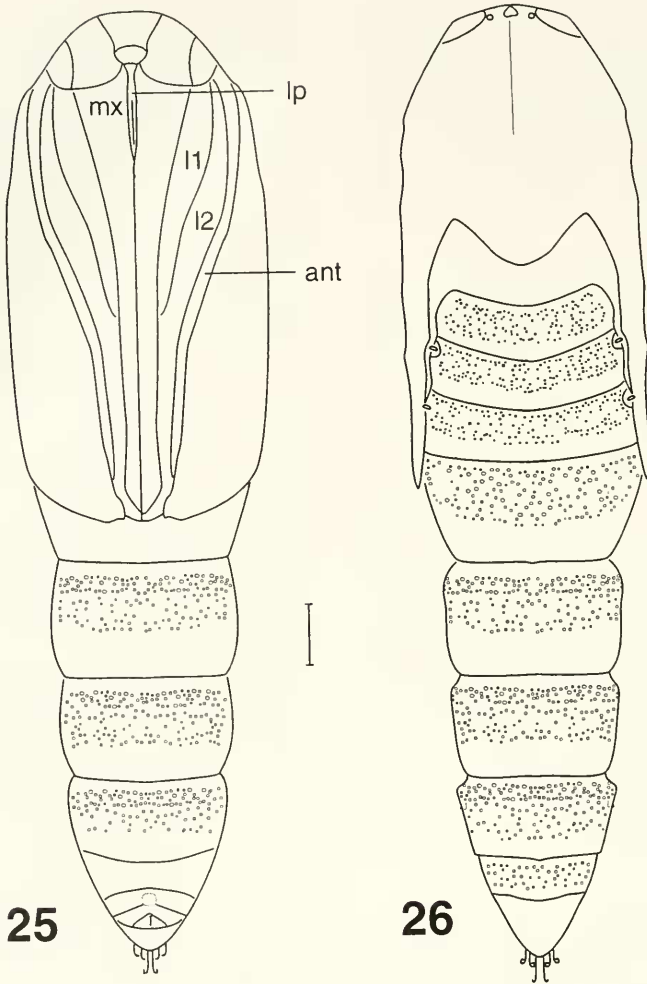
*Abdomen* (Fig. 3): Mid-dorsal quadrate marks light brown, less distinct on segments 4–6 and 9; dorsolateral band cream; lateral band broad, brown, broken by series of cream spots along dorsal margin; distinct cream spots slightly dorsal and posterior to spiracles. D1 seta inside, D2 seta outside dorsal patch. Segments 1 and 2 with SD1, L1, and L3 on brown pinacula. Segments 3–6 and 8 with SD1 and L group setae on brown pinacula. Prolegs cream; crochets in an uniordinal mesoseries. Segments 1 and 2 with 2 SV setae, SV1 represented by a sclerotized ring near SV3.

Pupa

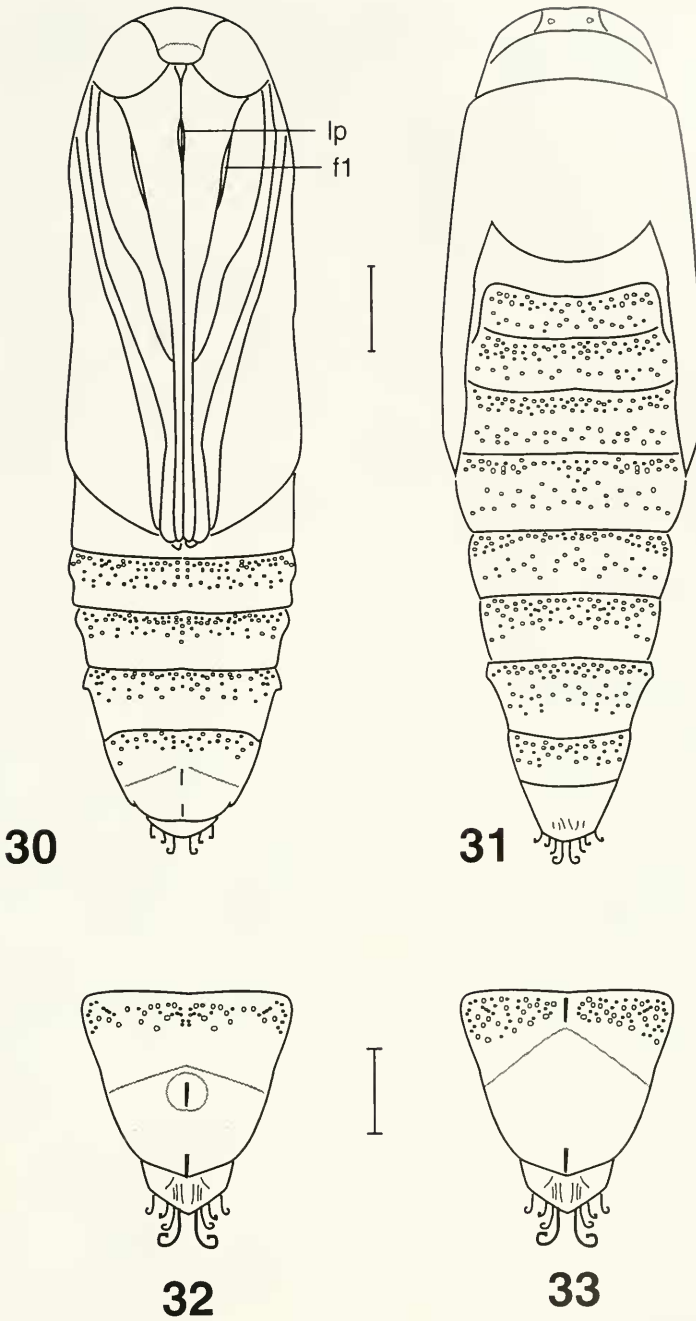
**Diagnosis.**—Labial palpus present, continuous; profemur present.

**Description.**—*Male* (Figs. 34–36): Length  $15.8 \pm 1.04$  mm (range, 15.6–19.6 mm) (n = 4). Labial palpi present, elongate, continuous. Profemur present. Mesothoracic leg reaching eye. Wings do not extend beyond caudal margin of segment 4. Segments 1–3 and 8 with shallow circular pits on dorsum; segments 4–7 with shallow circular pits in a dense band extending about  $\frac{1}{4}$  width of segment caudally and complete-

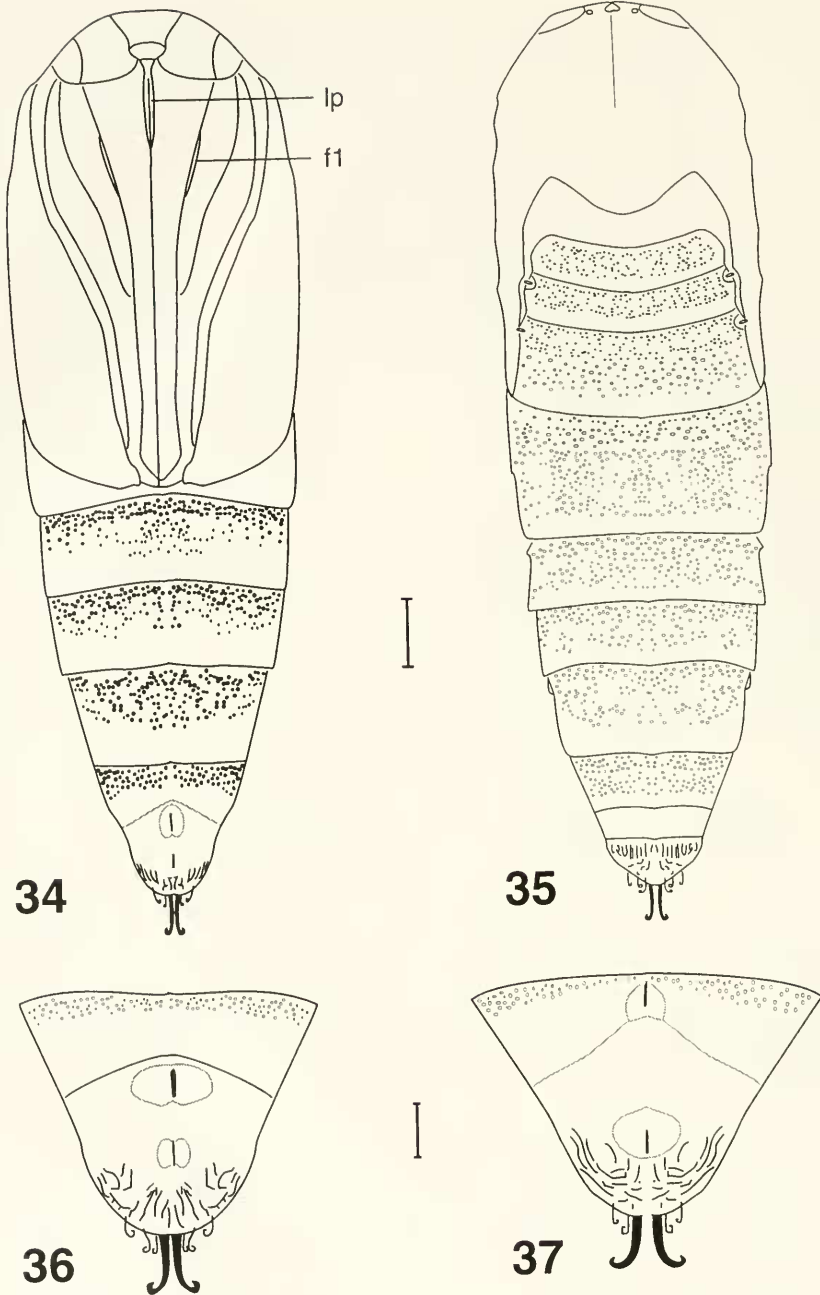




Figs. 25-29. *Eulepidotis merricki* pupa. 25, ♂ ventral view. 26, ♂ dorsal view (scale = 1.0 mm). 27, ♂ ventral view of terminal segments. 28, ♀ ventral view of terminal segments. 29, Dorsal view of terminal segments (scale = 0.5 mm). Abbreviations: ant = antenna; ao = anal opening; go = genital opening; lp = labial palpi; l1 = prothoracic leg; l2 = mesothoracic leg; mx = maxilla.



Figs. 30-33. *Eulepidotis juncida* pupa. 30, ♂ ventral view. 31, ♂ dorsal view (scale = 1.0 mm). 32, ♂ ventral view of terminal segments. 33, ♀ ventral view of terminal segments (scale = 0.5 mm). Abbreviations: fl = femur of prothoracic leg; lp = labial palpi.



Figs. 34-37. *Eulepidotis superior* pupa. 34, ♂ ventral view. 35, ♂ dorsal view (scale = 1.0 mm). 36, ♂ ventral view of terminal segments. 37, ♀ ventral view of terminal segments (scale = 0.5 mm). Abbreviations: fl = femur of prothoracic leg; lp = labial palpi.

ly encircling segments 5–7; segment 9 smooth. Genital opening on an oval plate. Anal opening caudad of genital opening. Cremaster consisting of a large median pair of curved hooks and 3 pairs of small hooks, 1 pair located mediodorsally, 2 pairs located laterally (Fig. 36).

*Female* (Fig. 37): Similar to male except: length  $16.1 \pm 1.03$  mm (range, 15.0–17.0 mm) ( $n=3$ ). Genital opening at caudal border of segment 8, dividing segment 8 ventrally. Anal opening well caudad of genital opening.

*Host*.—*Quararibea asterolepis* Pitt.; family Bombacaceae.

*Natural History*.—During late May through early June 1985, a massive, highly synchronized outbreak of larvae was observed on the central plateau of Barro Colorado Island, Republic of Panama (Wong et al. 1990). The larval host plant was undergoing leaf flush and the larvae were feeding on young leaves and often defoliating the trees. Once feeding was completed, the larvae descended on silk lines and pupated beneath dried leaves on the forest floor. Larvae were so abundant that it was difficult to avoid walking into their silk lines or stepping on larvae and pupae.

A total of 10 pupae and 3 larvae were brought to one of us (AA) by Maria Wong, Seiji Tanaka, and Peter Becker. Three pupae died, and seven were reared to adults. Adult no. 1 (♀) eclosed 21 June from a pupa collected 7 June. Adult nos. 4 (♂) and 5 (♀) eclosed 23 and 24 June, respectively, from pupae collected 11 June. Adult nos. 6–9 eclosed 18 June (♀), 20 June (♂), and 21 June (2♂♂), respectively, from pupae collected 14 June. All eclosions took place in early evening, some as early as 5:30 PM, and others as late as 9 PM.

*Discussion*.—Adults of *E. superior* are the largest (forewing length 13–9.5 mm) of the brown species of *Eulepidotis* and cannot be confused with any other species in the genus. It is distributed from Mexico to Panama in Central America, northwestern South America in Venezuela, Colombia, and Ecua-

dor, and in the Caribbean on the islands of Puerto Rico, Grenada, and St. Lucia.

#### ACKNOWLEDGMENTS

We thank Robin B. Foster of the Smithsonian Tropical Research Institute, Balboa, Republic of Panama, for identifying the host plant of *E. juncida*; Robert W. Poole of Entomological Information Services, Rockville, Maryland, for identifying *E. superior*; and Lionel Pagan of U.S.D.A., A.P.H.I.S., P.P.Q., San Juan, Puerto Rico, for supplying the immature stages and reared adults of *E. merricki*. We thank William E. Miller, University of Minnesota, St. Paul, Minnesota, and Douglass R. Miller and David R. Smith of the Systematic Entomology Laboratory, U.S.D.A., Beltsville, Maryland, and Washington, D.C., for critically reviewing and offering suggestions that greatly improved the manuscript. Linda Lawrence, Systematic Entomology Laboratory, U.S.D.A., Washington, D.C., prepared the habitus illustrations.

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